

wider, on the eastern shore of the lake. As one goes eastward the rainfall appears to diminish slightly. We have no record of the rainfall on the higher mountain ranges directly east of Salt Lake City.

To this we must add that the precipitation on these mountains is undoubtedly larger than in the lowlands. Moreover, there seems to be no record whatever of the amount of rain over the western portion of the lake and its watershed. For accurate and satisfactory study one ought to have river gagings sufficient to determine within 5 per cent the monthly and annual inflow into the lake on all sides instead of the few rainfall measurements that at present so imperfectly represent the rivers and the seepage.

With regard to the evaporation we can do no better than to state that inasmuch as it depends upon the temperature of the lake surface, on the sunshine and cloudiness, on the dryness of the air, and especially on the total wind movement, which latter depends upon both velocity and duration, it must be evident that it is impossible to make an accurate calculation of its total amount unless we have continuous records that are not now available. The best we can do is to make a general application of the investigations by Prof. Thomas Russell. See his *Depth of Evaporation in the United States*, MONTHLY WEATHER REVIEW, September, 1888, pages 235-239. In this memoir he shows that for Salt Lake City during the year July, 1887 to June, 1888, the depth of evaporation, in inches, from a surface of fresh water kept in a thermometer shelter at the Signal Service station would have been:

	Inches.		Inches.
1888, January	1.8	1887, August	10.7
February	2.7	September	9.6
March	3.6	October	6.5
April	7.2	November	5.0
May	6.9	December	2.3
June	8.9		
1887, July	9.2	Total annual	74.4

What the evaporation from a surface of salt water would have been we do not know.

In the Annual Report of the Chief Signal Officer for 1889, pages 159-172, Professor Russell gives an elaborate study of the rainfall and outflow in the Mississippi Valley showing that in general when the rainfall is heavy a much greater part of it reaches the river than when it is light; the ratio varies from $\frac{1}{2}$ to $\frac{1}{10}$.

It is hardly likely that the sum total of the influences of sunshine and cloudiness, dryness, and wind as affecting evaporation can be combined with the effect of rainfall and run off so as to be expressed by any simple function of the rainfall. But evidently we need more rainfall stations and a more complete record of the seepage through the soil and of the flow of streams into Salt Lake.

HARVARD'S METEOROLOGICAL STATIONS.

In a recent number of the MONTHLY WEATHER REVIEW we have described the important series of meteorological stations maintained during several years past in South America by the astronomical observatory of Harvard College, and extending from the Pacific Ocean to the Desert of Atacama and beyond. We regret to learn that this important work is now discontinued. However, undoubtedly, extensive additions to our knowledge will appear when the results are reduced and published. The following quotation is taken from the fifty-fifth annual report of Prof. E. C. Pickering, director of the observatory:

Meteorological observing stations have been maintained during the year at Mollendo, altitude 100 feet; La Joya, 4,150; Arequipa, 8,060; Alto de los Hiesos, 13,300; Mont Blanc, 15,600; El Misti, 19,200; Vinocaya, 14,600, and Puno, 12,500. Great difficulty has been found in carrying on the observations at the lofty mountain stations. Whenever possible all the stations have been visited once a month by a member of

the staff of the Arequipa station, and the self-recording and other instruments compared with various standard instruments, including a mercurial barometer and a psychrometer. Instruments designed and constructed by Señor Muniz, for recording automatically the velocity and direction of the wind, have been placed at all the stations, except those already provided with anemometers. The meteorograph which failed to give satisfactory results at the summit of El Misti has been placed at the Mont Blanc station, and has given records for about one-half of the time. The observations at these different stations have now been continued in many cases for eight or ten years. At such stations, where from the necessities of the case, the observers are generally men of limited education and experience, observations of the greatest accuracy can not be expected, except by maintaining trained observers at greatly increased expense. It is believed that the personal observations which have been secured, and the results of the records of the self-registering instruments, will furnish valuable information to meteorologists concerning a region about which little was previously known. Taking into consideration the striking uniformity of conditions which prevail in different years in this region, it is probable that additional observations would not greatly increase our knowledge. It has been decided, therefore, to suspend, at the end of the year 1900, the meteorological observations of all the stations except those at Arequipa.

REFLECTION BY CLOUDS OF LIGHT FROM A DISTANT FIRE.

Mr. T. S. Outram, Section Director at Minneapolis, Minn., reports that on the evening of March 14, between 9 and 10 p. m.:

A vertical shaft of light of a dull red color, situated about 15° from the zenith was observed bearing about 60° east of north. At that time there was a very brilliant conflagration at the distance of a mile or more in that direction. When first seen the sky for some distance around the shaft of light was partly overcast with fine cirro-cumulus clouds, and above these thin cirro-stratus clouds. The phenomenon was on the higher clouds and was distinctly seen through the ruddy reflection on the cirro-cumulus clouds. Later the cirro-cumuli passed off entirely, leaving the cirro-stratus, which were so thin that a few stars could be seen near the zenith. By 9:30 p. m. the sky was apparently clear, but at that time the shaft of light was so faint that it could hardly be seen. The greatest length of the shaft was equal to the distance between the two outer stars of the bowl of the Great Dipper. During the whole time the wind was north, blowing from 20 to 25 miles per hour.

The above description shows that we have here to do with the reflection of a distant light from the horizontal flat under surfaces of the crystals of snow that usually form cirrus clouds. When the sun is in a proper position near the horizon its rays are similarly reflected and give rise to vertical beams of light that usually form an integral part of solar halos. Of course, these crystals could not maintain their surfaces horizontal unless the air were very quiet, allowing them to settle downward very slowly.

HISTORY OF METEOROLOGY IN BELGIUM.

For sixty-seven years the Royal Observatory of Belgium has regularly published its *Annuaire de l'Observatoire Royale*, devoted to astronomy and meteorology, but, beginning with the year 1901, it will publish two separate works, viz, the *Annuaire Astronomique* and the *Annuaire Météorologique*. These small 16mo volumes will correspond to the quartos, viz, the *Annales Astronomiques* and the *Annales Météorologiques*, which began to be published separately in 1881. Magnetic phenomena will be published in connection with the *Annuaire Astronomique*, since the astronomical director, Dr. L. Niesten, has especially interested himself in this subject and is preparing to continue and publish the magnetic survey carried out by Houzeau and Estourgies in 1878-1882. A monthly magnetic bulletin in 16mo will be published, giving a résumé of the results of the self-registering instruments at the observatory, which is located at Uccle, near Brussels.

The *Annuaire Météorologique* for 1901 contains, among other interesting articles, a review of the history of meteor-